UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,342	06/23/2006	Hiroshi Suzuki	128458	3063

25944 7590 02/06/2008

OLIFF & BERRIDGE, PLC
P.O. BOX 320850
ALEXANDRIA, VA 22320-4850

EXAMINER	
MAIGA, FATOU G	
ART UNIT	**PAPER NUMBER**
1795	

MAIL DATE	DELIVERY MODE
02/06/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/584,342	SUZUKI ET AL.	
	Examiner	Art Unit	
	Fatou Gisele Maiga	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3, 5 and 8-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 5 and 8-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/23/06; 02/13/07; 02/20/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3, 5, 10-15 are obvious over Applicant's Admitted Prior Art (page 1, line 10 through page 2, line 26) in view of Iwase et al. US Patent 5,718,984.

3. As to claims 1 and 15, Applicant's Admitted Prior Art discloses a fuel cell comprising an electrode assembly having an electrolyte interposed between a pair of electrodes; sealing layers located to surround the periphery of the electrode assembly; and a pair of separators arranged across the electrode assembly and bonded to the sealing layers, where one of the separators facing one of the electrodes has a fuel gas conduit , while the other of the separators facing the other of the electrodes has an oxidizing gas conduit; but fails to disclose a method of disassembly comprising the steps of:

Supplying a specific fluid to at least one of the oxidizing gas conduits to facilitate separation of the electrode assembly from the pair of separators, where the specific fluid heightens an in-passage pressure of one of the oxidizing gas conduits or lowers the adhesive force of the sealing layers.

Iwase discloses a polymer electrolyte fuel cell (fig. 1, 10) comprising a polymer electrolyte (11) a cathode (12), an anode (13) and a pair of separators (14 and 15). The anode (12), the polymer electrolyte (11), the cathode (13), are joined via a proton conductive polymer electrolyte solution such as a Nafion solution. The cathode (12) has carbon material with catalyst platinum or catalyst-platinum alloy supported on carbon cloth as a base material. The polymer electrolyte membrane is joined on one side to the cathode and on the other side to the anode by the proton conductive-polymer electrolyte, serving as sealing layer (col. 7, lines 15-26).

Iwase further discloses through background of the invention (col. 1, lines 35-42) that separable sealing layers can be interposed between electrolyte and electrodes or between electrodes and outer parts such as separators.

In the recovery of the electrolyte polymer membrane, the joined polymer electrolyte membrane is immersed into an organic solvent such as methanol (col. 8, lines 44-55). The solvent is allowed to enter inlet flow paths (14P) and outlet flow paths (15P) of the separators/the fuel cells units.

The process of immersing weakens the bond between the electrodes and polymer electrolyte membrane, and dissolves the sealing polymer (col. 8, lines 57-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to disclose the method of separating the electrode assembly of the Applicant's Admitted Prior Art as taught by Iwase since such method provides an efficient disassembly of the fuel cell stack.

In claim 3, in the modified Applicant's Admitted Prior Art, Iwase in the method of disassembly, provided above allows the solvent to enter inlet flow paths (fig. 5A, 14P) and outlet flow paths (15P) of the separators/the fuel cells units.

In claim 5, Applicant's Admitted Prior Art discloses a fuel cell but fails to include a method of disassembly, wherein the separators are kept pressing during the fluid supply.

Iwase discloses a method of disassembly where the electrodes are kept pressed to the polymer electrolyte membrane when immersed into the solvent for a period of time to let the solvent react with the adhesion layer (fig. 5A).

It would have been obvious to one ordinary skill in the art at the time of the invention to keep the electrodes pressing during immersion in the method of disassembly of modified Applicant's Admitted Prior Art for further weakening the interface forces of the electrodes and the polymer electrolyte membrane.

In claim 10, Applicant's Admitted Prior Art discloses a fuel cell but fails to include a method of disassembly an external force to further separate the electrode assembly.

Iwase, in the recovery process of the polymer electrolyte assembly, peels off the electrodes (12, 13) from the polymer electrolyte membrane (col. 9, lines 15-25).

It would have been obvious to one ordinary skill in the art at the time of the invention to use external force to speed the process of dismantling the electrode

assembly of Applicant's Prior Art as taught by Iwase for a fast recovery of the electrolyte membrane.

In claims 11 and 12, Applicant's Admitted Prior Art discloses a fuel cell but fails to apply, in a method of disassembly, a pressing force to the separators of the fuel cell module or fuel cell stack.

Iwase discloses that the method of disassembly can be performed on a fuel stack module or on a plurality of fuel cells (col. 3, line 56 and col. 4, line 57), which components/parts get separated to get access to the fuel cell module. The stack of fuel cells are kept tight with clamping pressure, which pressure is reduced before providing the fluid supplying steps (col. 4, lines 40-45).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a pressing force to the electrode assembly of Applicant's Prior Art as taught by Iwase to let the fluid of disassembly react with the electrode assembly.

In claims 13 and 14, Applicant's Admitted Prior Art discloses a fuel cell but fails to include a coolant sealing layer for preventing leakage of coolant and a fluid supplying step after coolant removal step.

Iwase discloses that the fuel cell (10) includes coolant flow paths (fig. 3, 22, 23). In the recovery of the electrolyte membrane, the inlet and outlet flow paths serve as a gas seal when supported by the clamping pressure (col. 4, lines 29-31); therefore the

coolant flow paths (22 and 23) will serve as a seal for the coolant when the clamping pressure holds the stack of fuel cells.

Iwase further discloses, in the first step of the dismantling process, that the fuel cell stack is first soaked into liquid methanol to remove the water molecules; therefore it is obvious to know that other molecules such as coolant fluid is removed as well, note that water can act as a coolant (col. 8, lines 54-56).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include a coolant sealing layer for preventing leakage of coolant and a fluid supplying step after coolant removal in the method of disassembly of Applicant's Prior Art as taught by Iwase for an effective recovery process.

3. Claims 2, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Prior Art and Iwase as applied to claim 1 above, and further in view of Hoshi JP11-288732.

The modified Applicant's Prior Art fails to supply a fluid of disassembly different from a fluid supply for power generation and its temperature.

Hoshi, in a similar method of disassembling, cites that the fluid having the function of lowering adhesive force of sealing layers can be any high polar organic solvent, water, polar fluorine containing compounds or some reducing agents (paragraph 0018) which may be different from the fluid supplied for power generation of the fuel cell.

Hoshi further dissolves the electrode assembly in organic solvent from room temperature to 270 degrees °C (paragraph 0024) for complete dissolution.

It would have been obvious to one of ordinary skill in the art at the time of the invention to dissolve the electrode assembly of modified Applicant's Prior Art as taught by Hoshi in a temperature higher than the fuel cell operating temperature since solubility of the sealing layer increases with temperature, and since increase in temperature allows weakening of the adhesive force in a short period of time.

It would have been obvious to one of ordinary skill in the art at the time of invention to disclose in the method of disassembly of modified Applicant's Prior Art as taught by Hoshi other high polar fluid including organic solvent and water other than the one supply for power generation to lower the adhesive force at the interface of the separators and the electrolyte polymer.

4. Claims 16, 17, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Prior Art and Iwase as applied to claim 15 above, and further in view of Hoshi JP11-288732.

The modified Applicant's Prior Art to disclose that the sealing material is made of functional material/polymer resin material such as Nafion (col. 7, lines 21-25) and has a characteristic of lowering the adhesion force when exposed to a solvent (including water) or release agent at high temperature.

Hoshi, in a similar method of disassembling, dissolves the electrode assembly in organic solvent from room temperature to 270 degrees °C (paragraph 0018) for complete dissolution.

It would have been obvious to one of ordinary skill in the art at the time of the invention to dissolve the electrode assembly of modified Applicant's Prior Art as taught by Hoshi in a temperature higher than the fuel cell operating temperature because solubility of the sealing layer increases with temperature, and since increase in temperature allows weakening of the adhesive force for in short period of time.

4. Claim 20 is obvious over Applicant's Admitted Prior Art (page 1, lines 10 through page 2, line 26) in view of Iwase US Patent 5,715, 984 and further in view Takegawa JP2002-151112.

5. As to claim 20, Applicant's Admitted Prior art discloses the fuel cell comprises an electrode assembly having an electrolyte interposed between a pair of electrodes; sealing layers located to surround periphery the electrode assembly; and a pair of separators arranged across the electrode assembly and bonded to the sealing layers, where one of the separators facing one of the electrodes has a fuel gas conduit , while the other of the separators facing the other of the electrodes has an oxidizing gas conduit; but fails to disclose a method of disassembly comprising the steps of:

Supplying a specific fluid to at least one of the oxidizing gas conduits to facilitate separation of the electrode assembly from the pair of separators, where the specific fluid heightens an in-passage pressure of one of the oxidizing gas conduits or lowers the adhesive force of the sealing layers.

Iwase discloses a polymer electrolyte fuel cell (fig. 1, 10) comprising a polymer electrolyte (11) a cathode (12), an anode (13) and a pair of separators (14 and 15). The anode (12), the polymer electrolyte (11), the cathode (13), are joined via a proton conductive polymer electrolyte solution such as a Nafion solution. The cathode (12) has carbon material with catalyst platinum or catalyst-platinum alloy supported on carbon cloth as a base material. The polymer electrolyte membrane is joined on one side to the cathode and on the other side to the anode by the proton conductive-polymer electrolyte, serving as sealing layer (col. 7, lines 15-26).

Iwase further discloses through background of the invention (col. 1, lines 35-42) that separable sealing layers can be interposed between electrolyte and electrodes or between electrodes and outer parts such as separators.

In the recovery of the electrolyte polymer membrane, the joined polymer electrolyte membrane is immersed into an organic solvent such as methanol (col. 8, lines 44-55). The solvent is allowed to enter the inlet flow paths (14P) and outlet flow paths (15P) of the separators/the fuel cells units.

The process of immersing weakens the bond between the electrodes and polymer electrolyte membrane, and dissolves the sealing polymer (col. 8, lines 57-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to disclose the method of separating the electrode assembly of the modified Applicant's Prior Art as taught by Iwase since such method provides an efficient disassembly of fuel cell stacks.

Iwase further discloses peeling off the electrodes along a predetermined path (col. 13, line 11) but fails to form a breaking guide at the surface of the electrodes to function as a starting point of breakage.

Takegawa discloses a method of disassembly of the fuel cell, in which slots/breaking guide (cover figure, 27 and 29) are made on the separators (7, 9) and under the recesses is laid the sealing layer. In the recovery process of the components, the sealing layers are easily pulled through the slots (27 and 29).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include breaking guide as taught by Takegawa as a starting point of breakage for an easy separation of the electrolyte membrane and the electrodes in the modified Applicant's Prior Art.

6. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Prior Art, Iwase, and Takegawa as applied to claim 20 above and further in view of Hoshi JP11-288732.

The modified Applicant's Prior Art fails to supply a fluid of disassembly different from a fluid supply for power generation.

Hoshi, in a similar method of disassembling, cites that fluid having the function of lowering adhesive force of sealing layers can be any high polar organic solvent, water, polar fluorine containing compounds or some reducing agents (paragraph 0018) which may be different from the fluid supplied for power generation of the fuel cell.

It would have been obvious to one of ordinary skill in the art at the time of invention to disclose in the method of disassembly of modified Applicant's Prior Art as taught by Hoshi other high polar fluid including organic solvent and water other than the one supply for power generation to lower the adhesive force at the interface of the separators and the electrolyte polymer.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fatou Gisele Maiga whose telephone number is (571) 272-9804. The examiner can normally be reached on Monday-Friday 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FM

ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER